

Foster D Snell file

Snell Method for Determining Tar and Nicotine Content of Cigarette Smoke

Sample Selection

The cigarettes are conditioned at 77° F. (25° C.) and 50 per cent relative humidity, overnight. The average weight of 100 cigarettes is determined and only those cigarettes are selected for test which are fully packed and do not deviate from the average weight by more than 20 milligrams. A mark is made on each cigarette 25 millimeters from the mouthpiece end of the cigarette and the cigarettes are smoked to this butt length.

Five cigarettes are smoked for each single determination. Determinations for tar and nicotine are carried out in triplicate.

Smoking

Cigarette smoking is carried out in a manner similar to that described by Bradford, Harlan and Hammer in Industrial and Engineering Chemistry, vol. 28 (1936) page 836-839 under the title "Nature of Cigarette Smoke. Technic of Experimental Smoking." This is the same method employed by W. Wolman and described in "A Study of Cigarettes, Cigarette Smoke and Filters," Journal of the American Medical Association, July 4, 1953, page 917-920.

Smoking of the cigarettes is performed with a "Smoke Sampling Apparatus" designed by the Research Laboratories of American Tobacco Co., Inc., and manufactured by Phipps & Bird, Richmond, Va. This is a four-place colenoid-actuated mechanical smoking machine.

The smoke absorption train consists of a 300 ml Kjeldahl flask, containing 1 ml. of 0.5N hydrochloric acid and 10 ml. of Ethanol S23A,

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and two bubble traps. The first bubbler contains 5 ml. of 0.5N alcoholic hydrochloric acid. The second bubbler contains 5 ml. of 0.5N aqueous hydrochloric acid. The smoke delivery tube extends just below the surface of the liquid in the Kjeldahl flask.

With the cigarettes in place in the holders, the smoking machine is adjusted for volume and duration of puff. Standard smoking procedure is a 35 ml. puff of two-seconds duration, which is held for two seconds to establish equilibrium in the absorption train, taken once a minute until the cigarette is smoked to the predetermined butt length.

After five cigarettes are smoked through each set up, the smoke is allowed to settle for 20 minutes. All portions of the smoke collection train are washed into the flask with a minimum amount of hot alcohol.

Determination of Tar Content

The tar content of the smoke is determined by condensing and collecting it, at ambient room temperature, in the manner described above under Smoking. The apparatus train is washed with hot alcohol to remove tar condensed in the train and all washings placed in the tar condensate flask.

These are transferred to a weighed 150 ml. Griffin beaker with internal diameter of 50 millimeters. The beaker and its contents are placed on a steam bath. About 5 hours are required for evaporation of the solvent. The beaker is then transferred to a convection type oven where it is exposed to a temperature of 105°C. for 7 hours. It is then removed, placed in a desiccator where it is allowed to cool, and weighed.

Determination of Nicotine Content

Nicotine is determined on separately collected smoke according to the method described in Methods of Analysis of the Association of Official Agricultural Chemists, Eighth Edition, 1955, page 66.

The smoke condensate is transferred to a 500 ml. Kjeldahl flask. The condensate flask is rinsed with distilled water and the wash

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water transferred to the larger Kjeldahl flask. Ten milliliters of 30% aqueous sodium hydroxide and 10 grams of sodium chloride are added and the nicotine is removed by steam distillation. The delivery tube of the condenser extends below the surface of 10 ml. of 1:1 aqueous hydrochloric acid placed in an 800 ml. beaker. Approximately 500 ml. of distillate is collected.

To the distillate is added 2 ml. of 12% silicotungstic acid solution and the solution allowed to stand at room temperature for 5 days before filtering. The precipitate is filtered through a Gooch crucible and dried at 105°C. for three hours.

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